THE BRITISH JOURNAL OF TUBERCULOSIS

Vol. XXXIV. April, 1940. No. 2.

EDITORIAL

One of the problems so far unsolved by methods for the control of pulmonary tuberculosis is the high mortality from this disease among young adults. There has been little or no decline in the death rate at this age for the last forty years, and this despite the application of anti-tuberculosis schemes, improved economic and social conditions, the advent of radiography, and also of better resources for treatment such as artificial pneumothorax and surgical methods. It has long been known that the crux of the problem is early diagnosis; it is now realised that this implies recognition in a stage which is often preclinical—for then and then only does it seem possible to apply treatment with consistent success at this age. Thus diagnosis has to be made by the radiological method to be early enough. The recognition of this fact has led to the principle of periodic radiological examination, supplemented by careful clinical records and tuberculin tests.

The results of such surveys, carried out so far in selected populations, are impressive. A few years ago Heimbeck gave the results of such a scheme for nurses at the Ullevaal Hospital, Oslo, and Mariette for that at the Glen Lake Sanatorium, Minnesota. The Metropolitan Life Insurance Co., New York, started a similar scheme for their staff, and others have been established during the last few years both in America and various European countries for the benefit of students, nurses, employees and army recruits. At a recent meeting of the Tuberculosis Association a representative of the Philips-Metalix Company mentioned that their scheme achieved an annual saving of about £20,000 through the decreased illness of employees from tuberculosis. In this country the investigation of Wingfield, and that among medical students at University College Hospital, the results of which were published recently, have added further evidence. The collective material available leaves no doubt that pulmonary tuberculosis is detected

at a far earlier stage by such methods, and that the expense and labour involved repay a handsome dividend in reduced invalidism, lessened costs of treatment, and also pensions, and in the elimination of contact infection from chronic cases.

All this, though true for limited investigations among selected populations, has been inapplicable on a more extensive scale because of the large numbers of skilled staff required for the radiological work this would involve, the time that would be required, and the virtually prohibitive cost of ordinary radiographic methods. It looks as though the coming of miniature radiography of the screen image may go far to solve these problems; and in this number is an account of an important discussion on mass radiography at the Tuberculosis Association, and also a detailed description of an apparatus for miniature radiography recently devised in this country. The development of this method and its full trial are important, especially among recruits for the services, for the high risk from phthisis carried by the young adult is a military liability which is likely to increase in proportion as those who have incipient lesions are accepted for active service, let alone those with more advanced disease which remains undetected by clinical examination.

GENERAL ARTICLES

TUBERCULOUS PLEURAL EFFUSIONS

By J. REGINALD BEAL,
M.D., D.P.H.,
Clinical Tuberculosis Officer, County Borough of Sunderland.

At a recent meeting of the Liverpool Medical Institute attention was directed by G. S. Erwin (1938) to the deficiency of recent figures on the fate of pleural effusions, and in the course of this discussion the tendency to aspirate pleural effusions without justification was mentioned.

With these statements in view I propose to record a series of 74 consecutive pleural effusions seen during the period 1933-1935, with an analysis of their fate.

Hedges (1900), following up 130 cases of effusion from St. Bartholomew's, found that within six years or less " 43 per cent. had either died of pulmonary tuberculosis or other tubercular lesion, or presented signs of the former disease."

Similar figures were reported by Barrs (1890) and by two Swedish observers, Allard and Köster (1912).

E. A. Pierce (1918) analysed two series of cases from 1905 till the time of his report. In the first series of 1,767 cases of pulmonary tuberculosis, 614, or 35 per cent., gave a history of pleurisy. In the second series of 518 cases, 52 per cent. gave a history of previous pleurisy. He adds that, including simple adhesions with other marked changes, pleurisy was found in 74·4 per cent. of 215 cases.

Fishberg, quoting statistics as to the above, indicates that from 30 to 40 per cent. of patients suffering from pleurisy subsequently develop pulmonary tuberculosis.

Some clinicians have not had the same experience, and many report that, while pleurisy is often followed by pulmonary tuberculosis, this proportion is not so high as these figures would lead one to suppose. Out of 21 cases reported by J. P. Bramwell (1889) only 3 died of tuberculous disease.

Fishberg takes a very optimistic view and states that more than three-fifths of the number of patients with pleurisy pass through life without ever

developing pulmonary tuberculosis. He states that even when the pleurisy is due to the tubercle bacillus, active pulmonary tuberculosis does not follow in all cases, and, when it does, the outlook is not so gloomy as some statistics seem to show.

R. Coope (1938) states that the overwhelming majority of clear effusions are tuberculous, and to accept that fact frankly is the beginning of correct treatment.

It should be realised that an effusion is an incident directing attention to pathological processes in the underlying lung. It should not be regarded as an acute incident requiring treatment, but rather that the seriousness of the pathology be realised in regard to future treatment.

Burrell states that the prognosis depends upon the underlying condition in the lung. The pleurisy in itself is not dangerous; the danger lies in the possibility of a tuberculous focus in the lung developing into active pulmonary tuberculosis.

The problem is a difficult one, since figures are apt to be biased because a great number of pleural effusions are admitted to general hospitals and the lesion very often treated as an acute process. It is only the case subsequently developing pulmonary tuberculosis that is seen in the tuberculosis department, and, viewing from this angle, one may be over-impressed with the incidence of pulmonary tuberculosis following pleural effusions.

The series reported were those notified as suffering from tuberculous pleural effusion and, as such, received hospital and sanatorium treatment. These cases receiving adequate institutional treatment may give a too favourable picture of the prognosis of tuberculous effusions.

In Table I. are set out the notifications of pulmonary tuberculosis for the period 1933-1935, divided into age and sex groups, and also the number of tuberculous pleural effusions similarly subdivided.

TABLE I.

Age Groups.	0-1.	1-5.	5-15.	15-25.	25-35.	35-45.	45-55.	55-65.	65+.	*Total.*	*Percentage.*
Pulmonary tuberculosis (males) ...	1	18	50	132	91	84	48	24	5	453	
Tuberculous effusions (males) ...	—	1	15	16	14	7	1	1	—	55	12·1
Pulmonary tuberculosis (females) ...	2	15	45	93	76	60	34	12	2	339	
Tuberculous effusions (females) ...	—	2	4	9	2	1	1	—	—	19	5·6

In this series the occurrence of primary tuberculous pleural effusion was twice as frequent in the male as in the female, and the greatest incidence was in the age period 5-35 years.

The diagnosis in all cases was based on radiological examination and exploratory puncture, where possible.

The pleural fluid in all cases examined was of a clear, straw-coloured nature, with an excess of lymphocytes. In one instance tubercle bacilli were seen, otherwise the exudates were sterile. The presence of tubercle bacilli in pleural exudates is rarely demonstrable microscopically. Netter (1891), reviewing 415 cases of sero-fibrinous pleurisy, found on an average 2 per cent. in which tubercle bacilli could be demonstrated.

The effusion was left-sided in 47 cases and on the right in 27 cases. There was no marked seasonal incidence of cases, but the peak was reached in the April to June quarter.

There was a history of contact with a known case of tuberculosis in 12 instances (approximately 16 per cent.), and 50 per cent. of the contact cases were aged between $1\frac{9}{12}$-12 years.

When sputum was available for examination it was examined, and 6 males and 2 females were classified as T.B. positive. The remaining 66 cases were in the group T.B. minus.

It is of interest to record the complications and sequelæ that occurred in this series of cases.

	Male.	*Female.*	*Total.*
Tuberculosis of peritoneum	4	2	6
Tuberculous empyema	3	—	3
Tuberculosis of bones and joints	2	1	3
Tuberculosis of meninges	1	—	1
Tuberculous ischio-rectal abscess	1	—	1

The occurrence of tuberculous peritonitis in 6 cases should be noted, since the pleuræ should not be regarded as closed cavities, and communications exist between the lymphatics of the chest and abdomen, through the anastomosis between the thoracic and abdominal lymphatics covering the diaphragm.

Aspiration was performed in 22 cases (approximately 33 per cent.), in three instances on account of the fluid becoming purulent and in the remaining cases because the amount of fluid was causing respiratory embarrassment.

All cases received hospital and, later, sanatorium treatment, and in Table II. the present condition of the series is recorded, these cases having been under observation for a period of four to six years.

TABLE II.

	Male.	*Female.*	*Total.*
Quiescent	31	10	41
Not arrested	1	1*	2
Lost sight of	11	6	17
Dead	12	2	14

* Pulmonary lesion is quiescent, but has now developed a tuberculous spine.

Excluding the 17 cases lost sight of, it will be seen that, of the 57 cases traced, 41, or 72 per cent., are quiescent; 14, or 24 per cent., have died.

In regard to the deaths the figures can be improved, since two deaths were attributable to non-tuberculous conditions: one following operation for gastric perforation and another found at autopsy to be due to acute colitis and gastritis.

Of the remaining 12 deaths attributable to tuberculosis:

7 cases died from pulmonary tuberculosis.
2 cases died from pulmonary tuberculosis and tuberculous peritonitis.
1 case died from tuberculous meningitis.
1 case died from tuberculous empyema.
1 case died from pulmonary tuberculosis and articular tuberculosis.

Crediting the 2 non-tuberculous deaths to the quiescent cases, 75 per cent. of the cases recorded would now be quiescent and only 21 per cent. deaths attributable to tuberculosis.

Summary.

1. Of 74 cases of tuberculous effusion, 33 per cent. required aspiration.

2. All the cases were treated in hospital and sanatorium.

3. Of 57 cases traced after a lapse of four to six years, 72 per cent. are quiescent and 24 per cent. are dead.

4. Contact infection was marked between the ages 2 to 12 years.

5. The occurrence of tuberculous peritonitis as a complication in 6 instances is of interest.

REFERENCES

ALLARD AND KOSTER: *Brit. Med. Journ.*, 1912, vol. i., Epit. No. 64.
BARRS, A. G.: *Brit. Med. Journ.*, 1890, vol. i., p. 1058.
BRAMWELL, J. P.: *Edinburgh Medical Journal*, 1889, ii. 909.
BURRELL, L. S. T.: " Brit. Encyclopædia of Medical Practice," vol. ix., p. 704.
COOPE, R.: *Lancet*, 1938, ii. 1299.
ERWIN, G. S.: *Lancet*, 1938, ii. 1300.
FISHBERG, M.: " Pulmonary Tuberculosis," 3rd edit., p. 514.
HEDGES: *St. Bart.'s Hosp. Reports*, 1900, vol. xxxvi., p. 75.
NETTER: *Theses de Paris*, 1883; *Bull. Soc. de Méd. des Hôp.*, 1891, p. 176.
PIERCE, E. A.: *North-west Med.*, 1918, xvi. 79.

MASS RADIOGRAPHY OF THE CHEST, WITH SPECIAL REFERENCE TO THE PULMOGRAPH

By P. G. SUTTON,
M.S.R.,
X-ray Department, Stanley Cox Limited.

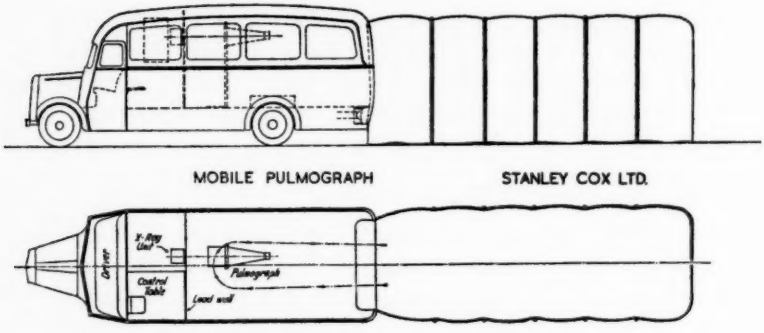
The high standard of radiography at the present time makes it possible, in many cases, to demonstrate abnormalities in the lung before physical signs have made their appearance; but to be of real value the radiograph should be available before the patient, through illness, is forced to seek the advice of the physician. In one European country it has been seriously suggested that the entire population should be radiographed at set intervals. Perhaps the British public might not take kindly to the idea of baring its breast to the radiologist every six months or so, but there are certain sections of the community to which mass chest radiography might be applied with beneficial results. I have in mind the Army, Navy and Air Force, the factory and school clinics, etc.

When thinking in terms of hundreds or thousands of chest radiographs per day it is at once apparent that the direct radiographic method on 15×12 film, which costs approximately 3s. per film, is quite out of the question. Screen examination is cheap and has been practised for a number of years, but it has many disadvantages. After many hours of screening the radiologist's powers of concentration and observation become dulled and may result in faulty diagnosis. Again there is the lack of documentary evidence, which, in spite of notes and sketches, makes it difficult to call to mind the screen appearance after the lapse of many days.

The paper negative is relatively cheap (approximately 1s. 6d. per 15×12 radiograph), but the process is too slow for mass radiography; an expert radiographer could not be expected to deal with more than thirty patients an hour. Another problem is processing and drying facilities. After a few hundred negatives have been developed, fixed and washed, I am afraid that the X-ray Department would resemble a suburban back garden on a Monday morning. An automatic cassette for X-ray paper which considerably increases the rate of exposure has been constructed by a continental manufacturer. The cassette consists of a light-tight and ray-proof chamber with a 14×14 inch window transparent to X-rays. The chamber

is mounted on a pedestal provided with a motor-operated platform on which the patient stands. The operation is similar to that of a film camera. A large roll of X-ray paper, 14 inches wide, is placed in the upper part of the chamber and the paper is led past the window to a take-up spool at the bottom of the chamber. The paper is moved after each radiograph by means of electro-magnetic relays. Although this method solves the problem of rate of exposure (it is claimed that from 200 to 300 radiographs can be taken an hour) processing and drying difficulties still remain.

The most satisfactory and speedy method of mass radiological examination of the chest is X-ray screen photography. The idea of photographically recording the screen image is neither new nor German. As far back as 1896, Bleyer of the U.S.A. published a description of his Photofluoroscope in the *Electrical Engineer*. The apparatus consisted of a stand camera



to which was attached a fluorescent screen. Many other workers have experimented with X-ray screen photography with little success, the main disadvantage being the lengthy exposures required, varying from one to twenty-five minutes.

Owing to the introduction of very fast fluorescent screens, the improvement in lenses, and, above all, the very marked increase in speed of photographic films, X-ray screen photography has now become a practical proposition. De Abreu was one of the first workers to obtain useful results, and in 1938 he published an article in the *Zeitschrift für Tuberkulose* describing his technique. At the German Radiological Congress in 1938 Janker, Kaestle, Branscheid and Böhme also related successes.

In X-ray screen photography cost of production of the radiograph is of primary importance, therefore a reduction in the size of the image is necessary.

The size of the negative is not arbitrary, but is dependent upon the covering power of the lens; the larger the dimensions of the negative, the more difficult it is to obtain a suitable lens of sufficient speed and sharpness. The most rapid lens in existence at the present time has an aperture of *f*/0·85, but such lenses are extremely expensive and are not suitable for X-ray screen photography. In the unit which I have designed for mass X-ray screen photography, which is known commercially as the " Pulmograph," I use a *f*/1·9 lens, which is very suitable, as it has only six air-glass surfaces and therefore gives a brilliant picture free from reflection.

There are many arguments in favour of employing a miniature negative. To mention a few:

1. The miniature negative allows a large number of radiographs to be produced on one strip of film.

2. The miniature film lies flat in the camera and the projecting lantern and thus avoids unsharpness.

3. Ease of movement in the camera.

4. It is less expensive and occupies less filing space.

It may be argued that if one uses a larger film, say 5 × 4 inches, the projected radiograph will be sharper, as a lesser degree of magnification is necessary. This, of course, is incontestable, but there are definite objections to using a 5×4 inch film. In the first place a *f*/1·9 lens to cover a 5×4½ inch negative is rather expensive. This size film is supplied in the form of roll film or film pack and does not lie absolutely flat in the camera and may give rise to unsharpness. The 5×4 inch film must be changed by hand after each exposure, thereby retarding the speed of operation.

From the technical and economical point of view I have found the 35 mm. cine film, using a 24×24 mm. frame, most suitable for mass X-ray screen photography.

The miniature cameras on the market are not suitable for X-ray screen photography when mass radiography is contemplated. For this type of work it is necessary to have a camera specially designed for the purpose. As speed is essential, it is important that special attention be given to the mechanism for moving the film. The camera used in the " Pulmograph " is entirely automatic in action and is operated by means of electro-magnetic relays through the X-ray exposure switch. An optical signal gives a warning when the last film of the strip is in position.

The following is a brief description of the " Pulmograph ":

A massive stand supports the camera unit and X-ray tube. The X-ray tube is permanently centred with the camera unit and both move simultaneously on anti-friction roller bearings.

The camera unit consists of—

1. A lead-lined tunnel with a 14×14 inch fluorescent screen and

2. An electrically operated camera with $f/1{\cdot}9$ 2-inch lens, producing a 24×24 mm. radiograph on 35 mm. cine film. The daylight loading film cassette holds 1 m. 60 cm. length of film (approximately 40 radiographs).

The X-ray unit consists of an oil-immersed single-valve transformer, output 120 mA at 80 kVP. The valve, filament transformers and timer contactor are all immersed in oil in the main transformer tank.

The control table contains a ballistic milliammeter, valve filament voltmeter, tube filament ammeter, kV regulator, mA regulator and synchronous motor timer with a delayed action-relay for operating the electrical camera.

The X-ray tube is a 10 kW " Univex," blower cooled.

The " Pulmograph " is intended for use in a department solely for the purpose of mass radiography. At the moment I am designing a model which may be used with existing X-ray equipment, and which may be of use in sanatoria for pneumothorax control, etc.

For public health purposes it might be advisable to supplement the foregoing models by a mobile unit in the form of a motor-van with an extending tent at the back. The van would contain the X-ray apparatus, etc., and the tent could be used as a dressing-room and office.

X-ray screen photography requires approximately five times the X-ray intensity that is required for normal chest radiography. However, as X-ray screen photography should only be regarded as a substitute for screen examination, the focal screen distance can be reduced to 36 inches and a higher kilovoltage employed. When using a suitable fluorescent screen, the film material available at the moment and a $f/1{\cdot}9$ lens, the radiographic factors will be approximately as follows:

36 inches focal-screen-distance; 80 to 85 kVP; 120 mA; $\frac{1}{8}$ to $\frac{3}{10}$ sec.

There are two British films on the market at present which are suitable for X-ray screen photography; they are the HP2 and the Super XX. Both these films are panchromatic and must be processed in absolute darkness. I would mention that research is being carried out in the film manufacturers' laboratories, and I have every hope that a film specially sensitised for the yellow-green light of the fluorescent screen will be available in the near future.

Very careful organisation is necessary if large numbers of patients are to be radiographed in a short period of time without confusion, mistakes or " re-takes."

When hundreds of radiographs are taken hourly it is very important that the details of each person to be examined are entered on a suitable index card, and that the negatives are marked in such a manner that they may be readily identified with the persons concerned. It is an advantage to

PLATE V

THE PULMOGRAPH.

[*To face page 58.*

conduct the examination in several stages and to take groups of patients through the individual stages. The greater number of radiographs taken per hour the larger will be the staff of assistants required for the organisation.

The marking of the negatives can be carried out by photographing either an identification number or a card containing the patient's name and particulars. The original model of the " Pulmograph " used the numerical system, but future models will be modified so that the card bearing the patient's particulars may be photographed on the miniature film.

The exposed strip of film is developed in a daylight developing tank. These tanks have a capacity of 250 to 500 c.c., and are suitable for developing one film strip (approximately 5 feet long—40 to 50 radiographs). If several tanks with spare spools are available, the developing process proceeds smoothly even when dealing with large numbers of films. For mass radiography, where thousands of radiographs have to be processed daily, commercial tanks are necessary.

There are two methods of examining the radiographs:

(*a*) Examination with lens.
(*b*) Projection.

When examining a small number of radiographs a lens with six to eight times magnification and some form of electrical illumination is all that is necessary. For the examination of large numbers of radiographs this method proves too fatiguing and resort must be made to projection.

By using a projector one can increase the magnification, and a suitable distance can be chosen so that the grain of the film is not too evident. The small projectors sold for amateur use are not suitable for the projection of the X-ray screen photograph. The prerequisites for good projection are a lens giving sharp detail and an adequate source of illumination, at least 250 watt, which can be regulated in intensity.

The projection screen should be constructed of very fine material. Silver paper and coarse linen screens cannot be recommended.

The storage of the film strips presents no serious difficulty. The best method is to cut the film into four strips of 10 radiographs each, place them in cellophane envelopes and file them in a letter file. Each file contains 4,000 radiographs, and 100,000 radiographs can be filed in a very small space.

The advantages of screen photography may be summarised as follows:

1. X-ray screen photography is of greater value than fluoroscopy, as it provides a permanent document.

2. The cost per radiograph is so small (approximately 1d. per radio-

graph) that it is now possible to undertake radiographic examinations on a large scale.

3. The radiographs can be filed in a very small space.

4. The time required for X-ray screen photography is much less than is required for fluoroscopy, therefore large numbers of the population can be radiographed in a relatively short time.

In conclusion I wish to emphasise that X-ray screen photography is not a substitute for normal radiography, as the screen photograph can never render such fine detail as the contact radiograph. It is, therefore, evident that any suspicious shadows demonstrated by the screen photograph must be confirmed by routine radiography.

I wish to acknowledge my indebtedness to Messrs. Stanley Cox Limited for permission to publish details of the " Pulmograph."

SULPHAPYRIDINE AND SECONDARILY INFECTED TUBERCULOUS EMPYEMA

By G. S. ERWIN,
M.B., CH.B.,
Medical Superintendent, Liverpool Sanatorium, Frodsham.

Crawford (1939) has successfully treated intercurrent intrapulmonary infections occurring in the course of pulmonary tuberculosis by means of M. and B. 693, and there is no doubt that the drug is finding increasing use in this field, but it should be borne in mind that the milder intrapulmonary invasions for which it is most often employed are, though serious enough to a pulmonary cripple, prone to spontaneous recovery. Secondary intrapleural infection, being usually severe and not infrequently complicated by a bronchial fistula through which the empyema is coughed up, would seem to call for similar treatment, especially as drainage, effective enough mechanically, is apt to fail in reducing the temperature. The type under consideration is that which is seen usually after rupture of a cavity, sometimes after spontaneous pneumothorax, and occasionally after cautery of adhesions, and which is characterised by prolonged fever of high degree, by progressive emaciation, spreading pulmonary disease, amyloid degeneration, and finally death from toxæmia. Even after adequate drainage the patient is seldom fit for the thoracoplasty which seems to offer the only prospect of recovery, and

conservative treatment adopted in the expectation of improvement is usually rewarded by a steady retrogression which disappoints physician and surgeon alike.

In these three cases an attempt has been made to reduce the severity of the infection, thereby testing the specificity of the new remedy.

CASE 1.—A young man with unilateral disease, being treated by artificial pneumothorax, developed absorption collapse and fluid. After several air replacements frank tuberculous infection of the fluid became evident, and a few months later some of the fluid was coughed up, proof of the presence of a bronchial fistula being afforded by the expectoration of methylene blue injected intrapleurally. The patient's condition improved for a time after prompt intercostal closed drainage, and the fistula closed readily, but subsequently there developed slowly progressive contralateral disease. A year after the induction of the pneumothorax a progressive increase of temperature was noted and deterioration commenced. The evening temperature had been at an average level of 101° for some weeks when treatment by sulphapyridine was instituted, but on the third day, 13 grammes having been given, severe hæmaturia and a subnormal temperature compelled cessation of the treatment. The presence of heavy albuminuria, the long history of sepsis, and hæmorrhage from the bowel, suggested a tentative diagnosis of amyloid disease. When the patient died a week later post-mortem examination showed that death was due to purpura.

CASE 2.—A man, aged twenty-seven, had a right artificial pneumothorax induced elsewhere and continued, despite a cavity suspended at the apex, until tuberculous pus developed. In April, 1939, closed intercostal drainage was established as a preliminary to thoracoplasty, but secondary infection with pyrexia supervened and the patient was submitted to a variety of treatments such as frequent removal and reinsertion of drainage tubes, antiseptic irrigations, gomenol, and anti-streptococcal serum. When the patient was finally evacuated to this sanatorium at the outbreak of war his fever was unabated in spite of adequate intercostal drainage, and he had developed a contralateral spread which almost precluded thoracoplasty. During the first fortnight in November a course of sulphanilamide, 40 grammes in all, was given, but with no effect other than gastritis. A month later a course of M. and B. 693 was commenced, but had to be discontinued on the third day (15 grammes) because of severe gastritis. Meanwhile the temperature had fallen below normal and remained so for three days before rising to its original level. As the prognosis was felt to be too hopeless to justify intramuscular or intravenous chemotherapy, the treatment was abandoned, and the patient has since died.

CASE 3.—A young woman of twenty-two first came to the sanatorium with a single cavity in the right lung, very little infiltration, an evening temperature of 99°, and huskiness dating from the onset of cough six or eight weeks previously. Although laryngoscopy showed only congestion it was assumed that this was an early tuberculous laryngitis and artificial pneumothorax was induced. Some adhesions prevented collapse of the cavity, which even appeared larger at one time, perhaps as a result of

bronchial obstruction. The temperature, huskiness, and cough having failed to improve after several weeks, thoracoscopy was performed and the adhesions successfully separated from the chest wall. Primary and secondary hæmorrhage occurred, and two months after operation a high temperature swinging to 103° developed. The hæmorrhagic fluid became purulent, and aspiration, which had always been hindered by clots or fibrin, eventually ceased to be effective. The patient commenced to cough up the fluid, and immediately a course of M. and B. 693 (15 grammes in three days) was commenced, and on the next day a self-retaining catheter was inserted and effective under-water drainage established. Simultaneously the temperature fell below normal, but it rose again to its original level after the drug had been discontinued. In the light of the experience gained from the two preceding cases, and as there was now no bronchial fistula, it was felt that the local effect of M. and B. 693 might be sufficient to abolish the secondary infection. Accordingly the soluble product was instilled through the tube, in sufficient dilution to achieve about twice the concentration to be expected in the blood stream, half a pint of the solution being left in for eight hours on four successive days. There was no diminution in the pyrexia. A week was allowed to elapse and a full course of 23 grammes of M. and B. was given by mouth. On the third day of this course the temperature fell and remained below normal for several days. About a week after the commencement of the course it began to rise again in the evenings, but only to 100 or 101°. This pyrexia persisted after a week and a further course was commenced. When only 10 grammes had been administered by mouth it had to be discontinued on account of vomiting and a temperature of 95°. Since then several months have elapsed and the evening temperature has not risen above 99°, a level which may be attributed to the pulmonary disease, for the cavity, which had disappeared when the fluid was at its maximum and absorption collapse appeared to be present in the underlying lung, reappeared even larger in size when the fluid was evacuated and the collapse had resolved. There has been no contralateral spread and the patient will later be treated by thoracoplasty.

Bacteriology.

In all three cases the microscopic picture of the pleural infection was similar, consisting of a mixture of pathogenic and non-pathogenic organisms, the former being chiefly staphylococci, streptococci, and tubercle bacilli. In Case 2 a hæmolytic streptococcus was demonstrated. In Case 3 only was a re-examination of the fluid undertaken after treatment, when it was found that staphylococci and tubercle bacilli had disappeared, though the absence of the latter cannot be attributed to treatment.

Comment.

The technique of oral administration recommended by Marriott (1939) was adhered to as far as possible, and in all there was evident a specific response to the drug, such response not having been observed after the

previous exhibition of sulphanilamide to one of them. In Case 3 the response to the first course was obscured by the almost concurrent, but very necessary, drainage of the empyema, although subsequent events proved that the fall in temperature could be attributed only to the chemotherapy. The failure of local applications of the sulphonamide group has been explained by Fleming (1940) as due to the inhibitory action of bacteria and dead tissues, peptones, etc., factors which must be abundantly present in the gross pleural infections under discussion.

The death from purpura, though unexpected, is not without precedent, for of all types of tuberculosis the case with secondarily infected pyopneumothorax is most prone to this terminal sequel, and the writer has seen two other cases, not treated by chemotherapy, succumb in this way. There is no doubt that the intensive sulphapyridine therapy employed in the case here recorded precipitated the hæmorrhages, none having occurred previously, but it is probable that the patient was in any case ripe for the complication. In the light of the experience gained from this case, a full blood investigation was carried out in Case 3 after the third course of therapy, but nothing suggestive of a hæmorrhagic tendency was discovered.

The presence of pulmonary absorption collapse in Case 3 prior to medication is of especial interest in view of the occasional complication of total unilateral collapse by pneumonia (Erwin, 1939), and it is quite possible that there was such an infection of the underlying lung contributing to the symptoms, for radioscopy during convalescence showed complete re-aeration of the lung. Although Case 1 also suffered from absorption collapse, there was no evidence of pneumonia at autopsy, and the few days elapsing between the crisis and death were insufficient to have allowed complete resolution of inflammatory consolidation.

The control of secondary pleural infection in these cases gives a more hopeful outlook to this otherwise fatal complication, reducing the local application of antiseptics to the pleura to a merely historical place in its treatment, but does not of itself settle the mechanical problem of the separated pleural surfaces, the apposition of which can only be effected by mechanical means—namely, thoracoplasty or high tension suction drainage according to circumstances. The early disposal of the secondary infection may, in those cases not troubled by a bronchial fistula, enable the surgeon to perform his thoracoplasty before draining the empyema, which is a not inconsiderable technical advantage.

Conclusion.

Sulphapyridine is specific in the control of that type of infection secondary to tuberculous empyema, which is characterised by a swinging temperature

and progressive deterioration, but its usefulness is limited to cases with an otherwise good prognosis.

REFERENCES

CRAWFORD, J. H.: *Brit. Med. Journ.*, 1939, i. 608.
ERWIN, G. S.: *Brompton Hosp. Reports*, 1939, vol. viii.
FLEMING, A.: *Proc. Roy. Soc. Med.*, 1940, xxxiii. 127.
MARRIOTT, H. L.: *Brit. Med. Journ.*, 1939, ii. 944.

CLINICAL CASE

CONGENITAL CYSTIC DISEASE OF THE LUNGS

BY PHILIP ELLMAN,
M.D., M.R.C.P.,

Physician in the Emergency Medical Service at Royal Blind School Hospital, Leatherhead; Consultant Physician to the Harts Sanatorium and the Tuberculosis and Chest Clinic, County Borough of East Ham, etc.

THE patient here described is a lady aged thirty-five years, unmarried, complaining of progressive loss of weight, especially during the last three months, palpitation and breathlessness, occasional cough (most marked in the winter months), with a trace of muco-purulent sputum on occasions. For the last two months she had been running an evening temperature of 100°.

She was a thin, slight woman, with a cyanotic tinge about the lips and face.

Clinical examination of the chest showed it to be of the asthenic pigeon type, with poorly developed musculature. The breath sounds were harsh and broncho-vesicular in type, and there were scattered râles and rhonchi throughout both lungs indicative of generalised bronchitis and emphysema.

There was no evidence of disease in the cardio-vascular or any other system.

There was no noteworthy family history.

She stated that she had been " chesty " all her life, and had several attacks of " bronchitis and pleurisy " at varied periods from the age of twenty-one.

PLATE VI

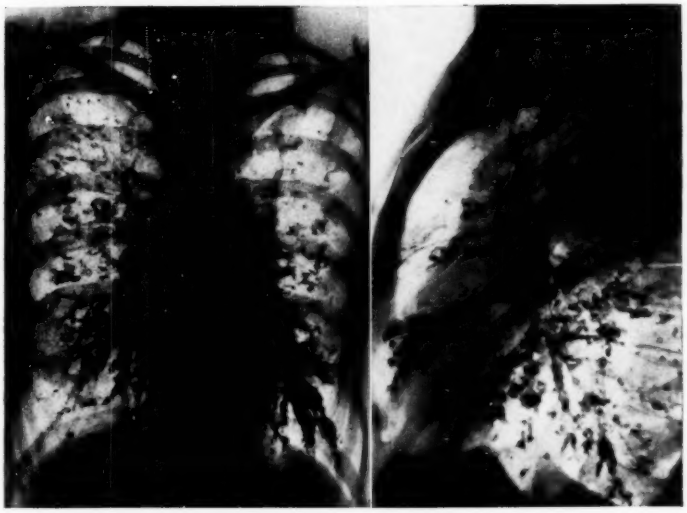


FIG. 1. FIG. 2.

FIG. 1.—BRONCHOGRAM SHOWING MULTIPLE CYSTIC CAVITIES WITH HORIZONTAL FLUID LEVELS. THE BASAL BRONCHI ARE DILATED. (ANTERO-POSTERIOR VIEW.)

FIG. 2.—BRONCHOGRAM OF THE SAME PATIENT. (LATERAL VIEW.)

[*To face page* 64.

Investigation.

Repeated sputum examinations were negative for tubercle bacilli and her blood sedimentation rate averaged 15 mm. in one hour (Westergren).

X-ray examination of the chest showed characteristically wide intercostal spaces with marked increased translucency of the lung structure, and close examination of the film showed thin-walled annular shadows which were considered to be cavities.

Bronchography confirmed these thin-walled cystic cavities with horizontal fluid levels and dilatation, more particularly of the basal bronchi (Figs. 1 and 2).

The case was regarded as one of congenital cystic disease of the lungs.

Commentary.

In a comprehensive paper on this subject, Sellors rightly states that congenital cystic lung is by no means a medical curiosity. Over 400 cases have been recorded, but many remain unpublished.

The cases are divided clinically into three groups:

(1) A large single cyst in newly born children producing asphyxia or other pressure symptoms.

(2) Those later in life simulating bronchiectasis because of secondary infection.

(3) Those giving little or no trouble during life except perhaps some chronic respiratory disorder.

It is with the last group that we are concerned. These cases may be clinically "silent" and are discovered either by accident or by the onset of some minor symptom such as persistent cough, some shortness of breath or loss of weight. These patients are often somewhat stunted in growth with a deep, short chest and a cyanotic tinge. They are suspected of having early pulmonary tuberculosis.

Pathologically, this type often has multiple medium-sized or small cysts either localised to one lobe or diffusely scattered. The cysts are essentially bronchial in character and therefore there is no sharp delimitation from cases of congenital saccular bronchiectasis. Cases of cystic lung are, however, regarded as having cysts larger than might reasonably be expected in bronchiectasis. The bronchi draining the cysts are of normal calibre and have no stenosis in their course.

Cystic disease of the lungs may sometimes be accompanied by cystic disease in other organs, and I have, in fact, recently had under my care a case of cystic disease of the lungs complicated by cystic disease of the kidneys.

REFERENCE

SELLORS, T. H.: *Tubercle*, 1938, xx., vols. 2 and 3.

TUBERCULOSIS IN THE ADOLESCENT FEMALE: INFLUENCING FACTORS

By J. REGINALD BEAL,
M.D., D.P.H.,
Clinical Tuberculosis Officer, County Borough of Sunderland.

The problem of the female age group 15-25 years is still of great interest in some localities, and the time appears opportune to consider the incidence and possible factors that may influence the heavy mortality and morbidity from tuberculosis in this group. It was with this object that the following article was conceived, since if the incidence could be controlled or prevented a vast amount of morbidity could be avoided.

Table I.

Year.	Males.			Year.	Females.		
	15-25 Years.	Total.	Percentage.		15-25. Years.	Total.	Percentage.
1929	27	113	23	1929	43	125	34
1930	31	129	24	1930	51	130	40
1931	27	92	30	1931	34	94	36
1932	42	148	28	1932	38	134	28
1933	53	168	31	1933	31	121	25
1934	39	161	24	1934	28	118	24
1935	40	124	32	1935	36	100	36
1936	31	115	27	1936	30	81	37
1937	29	117	24	1937	30	76	40
1938	20	108	19	1938	34	84	40

Table I. shows the total notifications of pulmonary tuberculosis for males and females for the quinquennia 1929-1933, 1934-1938; the notifications are also shown for the age group 15-25 years, male and female.

It will be seen that from 1932 there has been a progressive fall in the total number of notifications of pulmonary tuberculosis for both males and females. The fall has not been so rapid amongst the males, but in the case of the females the total notification curve has been very steep. In the male age group 15-25 years, the percentage fall has been gradual, comparable to the fall in the total male notifications. Considering the 15-25 years female group, the percentage figure shows a progressive rise, in spite of the fall in total notifications.

This feature is a disturbing one, since, from a national point of view, females in this group are coming to maturity and should be a great national asset. For this reason a survey of the various conditions operative is desirable, to discover any factors which can account for this phenomenon and any measure to be adopted to avert this feature.

TABLE II.—FATE OF CASES.

	Total Cases.	*Died in 1934.*	*Died in 1935.*	*Died in 1936.*	*Died in 1937.*	*Died in 1938.*	*Died in 1939.*	*Total Dead.*	*Left Area.*	*Alive Dec. 31, 1939.*
1934 ...	28	6	8	3	1	1	0	19	5	4
1935 ...	36	0	7	5	4	3	0	19	4	14
1936 ...	30	0	0	7	6	2	4	19	5	6
1937 ...	30	0	0	0	10	6	1	17	0	13
1938 ...	34	0	0	0	0	12	5	17	2	15
Total ...	158	—	—	—	—	—	—	91	16	51

Firstly, the type of disease and fate of the case can be reviewed. In Table II. is set out the fate of the cases from 1934 to 1938. It will be noted that of the 158 females aged 15-25 years, 91 cases, or 58 per cent., had died by December 31, 1939; 16 had left the area; and the survivors number 51, or 33 per cent. The largest number of deaths occurred in the first two years subsequent to notification.

This heavy mortality could be ascribed to three possible causes:

(1) Delayed notification of the case.

(2) Failure of patient to obtain early medical advice.

(3) The acute progressive type of disease.

In my opinion the first suggestion can be entirely ruled out. In regard to the second possibility, I think that this may play a contributory part, since patients in this age group do not easily seek medical advice, in view of possible curtailment of their enjoyment.

The third cause is, in my opinion, the most significant, in so far that the cases when seen are of an acute type and, with all methods of treatment, tend to a slow progressive deterioration.

As a corollary to this last paragraph one is faced with the problem as to why we get this type of disease in this group. Is it the virulence of infection, or due to lack of resistance? It is hard to believe that virulence is the cause, since if this were the case one would expect a similar state of affairs to exist in the opposite sex and age group. In view of this one can only come to the conclusion that the excessive incidence is due to increased risk of infection and lack of resistance.

TABLE III.—CONTACT HISTORY.

	Total Cases.	*Contact with Known Case.*	*Family History Confirmed.*
1934	28	5	4
1935	36	5	6
1936	30	6	3
1937	30	3	5
1938	34	3	7
	158	22	25

The possibility of increased risk of infection can be considered, and in Table III. is set out (*a*) history of contact with a known case, (*b*) family history of tuberculosis.

In 158 cases there was contact with a known case of tuberculosis in 22 instances—*i.e.*, 14 per cent.; and a family history in 25 instances—*i.e.*, 16 per cent. That is to say that in 30 per cent. of cases there was a definite history that infection could have been acquired in the home.

Let us now consider the result of contact examination for the years 1934-1938. The average number of cases of tuberculosis discovered by this means was 3·8 per cent. of contacts examined. It would seem that, from these figures, there is eight times the risk of a person of this age group developing tuberculosis than the average risk of a person living in a tuberculous household.

TABLE IV.—OCCUPATIONAL TABLE.

	Cases.	*Dead.*		*Cases.*	*Dead.*
Household duties (married)	27	18	Laundry	5	3
Domestic	21	14	Dressmaking	5	3
Shop assistants	20	9	Catering, waitresses ...	5	1
Home duties (single) ...	19	12	Printing	3	1
Nil	15	7	Bottlers	3	3
Miscellaneous	9	4	Bakery	2	2
Nursing	7	2	Sweet factory	2	2
Clerks, typists	6	3	Machinists	2	2
Rope-work	6	4	Mattress-maker	1	1

What part does occupation play in this increased liability?

Table IV. sets out the various occupations of the patients, and in 82 cases out of 158 over 50 per cent. of the cases were engaged in home duties; shop assistants contributed 20 cases—*i.e.*, 12 per cent.; nursing profession 7 cases; clerks 6 cases; roperies 6 cases; laundry, dressmaking and catering work 5 cases each. From these figures occupation would appear to have very little influence on incidence, and it would seem that infection in the majority of cases was contracted in the home.

TABLE V.

	Aged 15-20 Years.			*Aged 20-25 Years.*			
	Married.	*Single.*	*Total.*	*Married.*		*Single.*	*Total.*
				Cases.	*Died.*		
1934	0	9	9	8	6	11	19
1935	0	19	19	4	3	13	17
1936	1	13	14	4	3	12	16
1937	0	15	15	3	2	12	15
1938	0	16	16	7	4	11	18
Totals	1	72	73	26	18	59	85

This leads up to a consideration of the two age groups 15-20 years and 20-25 years, and the marital state is detailed in Table V. Apart from 1934 it will be noted that the distribution of cases in the two age groups is almost equal. In the 20-25 group 26 of the 85 cases were married; of these patients 9 had no family, 11 had one child, 4 had two children, 1 had three children, and 1 had four children. It would seem that, in this series, child-bearing was not a predisposing factor, but, considering that of these 26 cases 18 patients died, one cannot but consider that child-bearing accelerated the progress of the disease.

TABLE VI.—HOUSING ACCOMMODATION OF 144 CASES (AGED 15-25, FEMALE).

Number of Rooms Occupied.	*Size of Family. Number of Persons.*													*Number of Families.*	*Overcrowded under 1935 Housing Act.*
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.		
1 room ...		4	4	4										12	8
2 rooms ...		8	1	5	8	1	6	1	1					31	22
3 rooms ...		4	9	12	4	7	4	2	3	1				46	17
4 rooms ...		1	6	4	10	9	2	2		1				35	1
5 rooms ...					7	4	2	2	1			1	1	18	2
6 rooms ...															
7 rooms ...				1			1							2	
											Totals		...	144	50

Another factor which undoubtedly plays a part is housing accommodation, since, if the soil is suitable, overcrowding will serve to disseminate the seed. Taking a survey of the housing accommodation of 144 cases and accepting the standard of the Housing Act of 1935, which may be adequate for a healthy household, but is totally inadequate where an

infectious disease such as tuberculosis is concerned, it will be noted that out of 144 cases 50 cases were in officially overcrowded houses.

TABLE VII.—AVERAGE INCOME PER HEAD OF 91 CASES (AGED 15-25 YEARS, FEMALE) AFTER RENT HAS BEEN DEDUCTED.

Average Income (Weekly).	*Number of Cases.*	*Number of Cases Dead.*
5s. per head, or less	19	12
Over 5s. and less than 7s. 6d. per head	27	17
Over 7s. 6d. and less than 10s. per head	23	17
Over 10s. and less than 12s. 6d. per head	8	5
Over 12s. 6d. and less than 15s. per head	4	1
Over 15s. per head	10	6
Totals	91	58

The average income in the case of 91 families is shown in Table VII., and of these, after deduction of rent paid, 69 cases had an income of less than 10s. per head.

It would seem, therefore, that overcrowding and poverty both acted as contributory factors in the dissemination of infection, but these alone would not explain the heavy incidence in this group, because these factors are also operative in other groups, male and female.

A consideration of the state of a similar age group of females, the nursing staff at a municipal hospital, is indicated. During the years 1936-1939 Mantoux tests have been carried out upon the nursing staff, and 188 nurses have been tested by this intradermal tuberculin test. The following results were obtained:

Total Number of Nurses Tested.	*Dilutions.*					
	1/10,000.		1/1,000.		1/100.	
	Positive.	*Negative.*	*Positive.*	*Negative.*	*Positive.*	*Negative.*
188	69	119	90	29	7	22

Re-tests were carried out on the negative reactors in 20 instances, with the following results:

Number Retested.	*Dilutions.*					
	1/10,000.		1/1,000.		1/100.	
	Positive.	*Negative.*	*Positive.*	*Negative.*	*Positive.*	*Negative.*
20	7	13	8	5	0	5

During this period, of the nurses positive in the primary test, 3 have developed tuberculosis, the location of the disease being in the lungs in 2 cases and in another the spine. It will be seen that, of the 188 nurses primarily tested, approximately 12 per cent. showed no evidence of tuberculinisation. The experience of Heimbeck had not been found to apply in our 188 nurses, since it is in the positive reactor group that cases of tuberculosis have occurred; but this may be explained by the fact that the negative reactors were not allowed to nurse tuberculous cases. Even so, 75 per cent. of the negative reactors became positive whilst performing ordinary hospital duties.

As the number of cases of tuberculosis decline with improved environment at home and at work, and with a clean milk supply, the tuberculin sensitivity may be expected to decline—and one wonders if the primary reason for the heavy incidence and mortality in the age group 15-25 years is due to this age group being deficient in tuberculin sensitivity. I am afraid the answer to this great question can only be given when an extensive tuberculin survey has been carried out, which at this time seems impracticable.

ACCIDENTAL PNEUMOPERITONEUM DURING ARTIFICIAL PNEUMOTHORAX TREATMENT

By Y. G. SHRIKHANDE,
B.SC., M.B., B.S., T.D.D. (WALES),
Medical Superintendent, King Edward VII Sanatorium, Bhowali, U.P., India.

The patient (N. Z. C.) was admitted to the Sanatorium on July 17, 1938, with evidence of clinically active tuberculosis in the right lung. Tubercle bacilli were present in sputum. The duration of illness at the time of admission to the Sanatorium was sixteen months, and it was therefore thought that adhesions were probably present, a view supported by deficiency of breath sounds over the whole of the right side of the chest.

The patient was therefore treated at first by injections of gold (Solganal-B oleosum). As, however, the sputum remained positive, it was decided to attempt artificial pneumothorax. This was done on March 14, 1939, and proved successful, 200 c.c. of air being put in. Fluoroscopic examination was done on March 21, 1939, after the fourth refill, when nothing unusual

was noticed. Another fluoroscopic examination was done on April 25, 1939, in the ordinary course, when it was noticed for the first time that air was present under the diaphragm on both sides. This was confirmed by taking skiagrams of the chest (Fig. 1). No air was, however, present in the pleural cavity. All the refills were given in the 7th, 8th and 9th interspaces in the mid-axillary line.

It has been said that this accident sometimes occurs after repeated attempts to establish an artificial pneumothorax when in trying different spaces an interspace too low is struck and consequently the needle enters the peritoneal cavity. The sites chosen, the 7th, 8th and 9th spaces, are not ordinarily likely to cause the complication, as the inferior level of the pleura in the mid-axillary line is at the tenth rib. Possibly the rather high position of the right dome of the diaphragm contributed to the accident in this patient.

REFERENCE

GAETAN, L. R.: "Accidental Pneumoperitoneum," *Amer. Rev. Tubercul.*, 1939, xxxix., 537.

PLATE VII

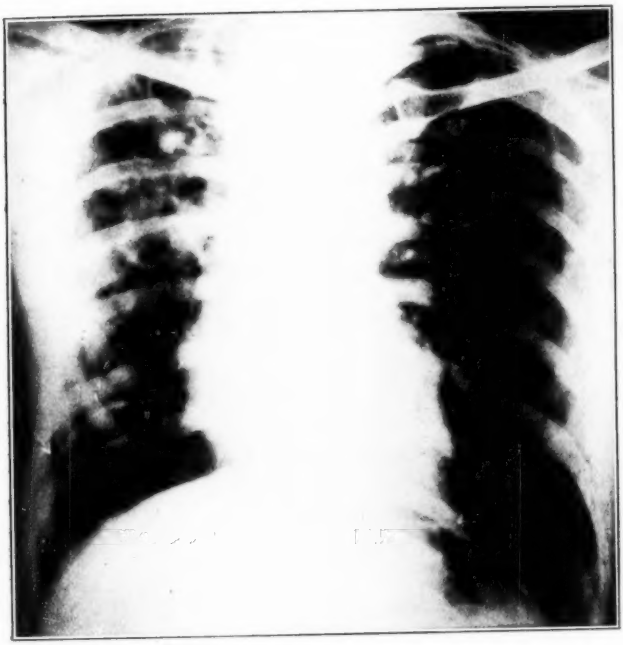


FIG. 1.

[*To face page 72.*

MEETINGS OF SOCIETIES

THE TUBERCULOSIS ASSOCIATION

AT two meetings of the Association held on February 16 under the chairmanship of Dr. G. T. Hebert, the subject of " Mass Radiography of the Chest " was discussed.

In his opening paper, Dr. P. M. D'Arcy Hart said that this procedure had become increasingly used during the last decade, particularly among students and nurses, factory operatives, unemployed persons, employees of certain large corporations and native village populations in the East. It was now claiming attention as a method of examination of recruits. He stressed the importance of periodic examination as opposed to a single radiograph, taken, for example, on entering employment in a factory. When this was done it had been shown already that an immediate drop occurred in the annual incidence of tuberculosis in the community concerned, owing to the removal of chronic cases and the recognition of fresh ones as they developed. About 0·5 to 2 per cent. of populations examined by mass radiography had been found to show tuberculous lesions; the exact figure depended much upon the type of population, especially its social status. It ought to prove a great financial saving to industrial bodies, because the earlier discovery of cases meant a reduction in the length of treatment and in the period required for rehabilitation. Dr. Hart went on to describe the scheme of mass radiography of the chest carried out since 1936 on University College students, and he emphasised the importance of such schemes as a means of discovering contacts. The average number of persons in the families of England and Wales was 3·72. If one person in the family had tuberculosis, it meant there were 2·72 contacts, but the ratio of new contacts examined to new cases on the tuberculosis registers was 1·2 to 1·0, instead of 2·72 to 1·0. This meant that less than half the possible contacts were examined.

Dr. Andrew Morland then described the University College Hospital experiment. Ninety-four out of the original 250 students had been under observation for three years, and, including new students during the experiment, the total number examined was 417. Those with calcified glands and slight apical scars had been excluded and also those with doubtful shadows which proved to have no significance. Only twenty-six had lesions which were regarded as tuberculous. Two of these proved to be non-

pulmonary, two were found to be healed and five others had old pleurisy. Thirteen showed fluffy shadows, and of these twelve, diagnosed on routine radiological examination, were free from symptoms at the time. Only one student was examined on account of symptoms, and these were due to diabetes, not to tubercle. Two only had a positive sputum and five were advised to have sanatorium treatment. Although no serious progressive cases of pulmonary tuberculosis had been discovered, he regarded this as due to good fortune, and the scheme had enabled twelve with early disease to be watched carefully and treated at an unusually early stage where necessary.

In the following discussion, the Chairman pointed out that medical students were in a different position from that of the average army recruit. He had seen a considerable number of cases of tuberculosis in medical students, and some of them had undoubtedly remarkable powers of resistance and recovery. The crux of the problem was where the fluffy shadow had to be taken seriously. Medical students who had a shadow of this kind might, perhaps, be allowed to continue their studies under supervision, but the recruit with a similar lesion could hardly be allowed to continue military training. Dr. F. J. Bentley pointed out, with reference to the remark that the "ideal number" of contacts was 2·72, that this included the very young and the very old, who were not fruitful sources of investigation. Mr. J. E. H. Roberts agreed with the view expressed by one speaker that it should be made compulsory for the whole population between certain ages to undergo X-ray examination. Public health in this country was still "an infant on the bottle." When it was weaned and got bigger it would insist on compulsory examination of the chests of the population. Pulmonary tuberculosis was not the only disease to be considered in a mass examination. Dr. S. Vere Pearson spoke of the success of the Peckham Health Centre, unfortunately stopped by the war, in which people were voluntarily examined as family units. This examination did not include radiological examination of the chest, though that would probably have come. He was opposed to mass compulsion, feeling that the better way was to have a health centre in a thickly populated area.

At the second meeting, technical problems connected with the subject of mass radiography were considered. Dr. S. Cochrane Shanks dealt chiefly with the consideration of army recruits, in which large numbers of records and rapidity of examination were required. He said that the available methods for the mass radiography of hundreds of thousands of subjects were (1) large-sized films or X-ray paper, (2) screen examination alone, or (3) miniature radiographs in one or other of their forms. Straight radiography on to X-ray film or paper was extremely expensive; screen examination required large numbers of expert staff and had the disadvantage of

providing no permanent record. Miniature radiographs, which appeared to meet this particular necessity, consisted of photographs of the screen image on either miniature or medium-sized film. If it were done on a large scale, probably the use of 35 mm. cine film would become general, and this would be convenient at medical board examinations. There were 150 medical boards in this country, each board examining between thirty and sixty cases a day. Radiographic examination should take place a week or two prior to the recruit's appearance before the board, so that the X-ray picture was available. It would then supply a useful supplementary examination. Dr. Shanks then mentioned three outfits which were available for the purpose: the Siemens-Holfelder unit, the Philips-Metalix unit, and a design by Stanley Cox Limited. In the Siemens "fluoroscope camera" the unit was linked up with a high-tension generator and the camera took a film suitable for forty to forty-five exposures. The Philips-Metalix apparatus embodied a condenser discharge method energising the film, and again the camera took forty-five exposures. It was not sufficient for mass radiography simply to attach the camera to the screening stand of the existing department, for this would clearly prevent uniformity in results. He then went on to discuss other technical and administrative points that would be required in the development of a satisfactory technique. The interpretation of these radiographs would be done best with a projector magnifying the image to life size on a small screen. The reporting should be done jointly by a radiologist and a chest physician. A controlling body would be required to organise the optimum routine and technique in units throughout the country and to ensure uniformity in the diagnostic criteria which would be used.

Mr. P. G. Sutton, of Stanley Cox, Limited, then described the "pulmograph" which he has designed for the purpose of mass radiography. He described the principles governing the optical reproduction of the fluorescent image. A very fast lens of F/1·9 was used with an exposure of one-fifth second, operated by an electro-magnetic release. The X-ray tube and the camera would be operated simultaneously. A Levy-West screen was used and a 35 mm. film was both the most economical and handy. It was hoped that a film specially sensitive to the green-yellow of the fluorescent screen would shortly be available. In further discussion, Mr. Gray, of the Philips-Metalix Company, mentioned that at this firm's factory in Holland, where between 20,000 and 25,000 workers were employed, a scheme of chest radiography had been in existence for some years and up to 100,000 examinations had been made. After accounting for all expenses the company estimated that a saving of about £20,000 had been made annually by the decreased absenteeism due to tuberculosis.

JOINT TUBERCULOSIS COUNCIL

THE first meeting of the Joint Tuberculosis Council to be held since the war took place in London on February 17, with Dr. S. Vere Pearson in the chair. He welcomed Dr. Rohan Williams, appointed to the Council to represent the Faculty of Radiologists, and Dr. Norman Smith, Ministry of Health "observer." A letter from the National Association for the Prevention of Tuberculosis was considered, in which an inquiry was suggested into the position of tuberculosis officers who had been called upon to take up special duty under the Emergency Medical Service. A committee was instructed to go into this matter and report direct to the standing advisory committee to the Ministry of Health.

Dr. D. A. Powell (Welsh National Memorial Association) was appointed chairman for 1940; Drs. Ernest Ward and James Watt, vice-chairmen; Dr. G. Jessel, honorary treasurer; and Dr. J. B. McDougall, honorary secretary. A vote of thanks was passed to Dr. Vere Pearson for his services for the past three years.

Dr. F. R. G. Heaf then presented a memorandum on the future of sanatoria, taking into consideration the new hutment accommodation provided under the Emergency Medical Service Scheme. He pointed out that tuberculosis activities in the future would be governed by rigid financial economy, an increase in the incidence of the disease, a demand for better facilities for earlier diagnosis and a need for more uniform effort to provide rehabilitation and after-care. On the other hand, there would be available a number of upgraded sanatoria with considerably increased accommodation. The new pavilions were likely to last for many years, and more than 6,000 beds had already been added to institutions for the treatment of tuberculosis, an increase of over 20 per cent. on the present accommodation in England and Wales. Any application from local authorities to use the pavilions would probably be considered favourably by the Ministry under satisfactory financial terms. There were some disadvantages, for they were often situated too close together, with large wards and a restricted outlook, and the best use to which the new wards could be put would probably be for hostels and workshops for ambulant quiescent and early suspect subjects. Given a national scheme of rehabilitation, these pavilions might well form nuclei of rehabilitation centres throughout the country. Dr. Heaf's memorandum was accepted and referred to the Care and Employment Committee, which is to report later in the year.

A motion of Dr. G. Lissant Cox, the possible co-ordination of tuberculosis schemes of local authorities on the lines of the Emergency Medical Service, was then discussed. Many local authorities were not large enough

to deal adequately with the tuberculosis problems in their areas and a regional scheme might make better co-operation possible, as, for instance, in Wales under the Welsh National Memorial Association.

Dr. R. L. Midgley presented the report of a committee on the treatment of gold in pulmonary tuberculosis. This embodied the result of a questionnaire on the subject to 364 people, only one-third of whom took the trouble to reply. Such deductions as can be made from the replies are that gold is losing favour, and the minority who use it do so for its immediate rather than its remote effects. It was difficult to dissociate these results from the results of routine sanatorium treatment.

Professor W. H. Tytler presented a report on the disinfection of books after use by tuberculous patients, and Dr. C. O. Hawthorne presented a report on the present position of milk in relation to tuberculosis. He was asked to submit a memorandum on the subject at the next meeting of the Council on May 18.

LEON BERNARD MEMORIAL PRIZE

We have been informed by the International Union against Tuberculosis that owing to the present circumstances the award of the Leon Bernard Memorial Prize has been postponed for two years.

REVIEWS OF NEW BOOKS

King Edward VII Welsh National Memorial Association. The 27th Annual Report for the Year ended March 31, 1939.

In this bulky volume of nearly 300 pages are to be found the statistical details for tuberculosis in Wales in the last administrative year. They cover every aspect of tuberculosis care and, in special sections, the work of individual sanatoria, hospitals and areas, as dealt with by the reports of Medical Superintendents and Tuberculosis Officers.

In the report of the Council an account is given of the Welsh National Temple of Peace and Health, and the opening ceremony on November 23, 1938, followed by a short summary of the principal points in the recommendations of the special committee set up by the Council of the Association to review the report of the Committee of Inquiry into the anti-tuberculosis service in Wales and Monmouthshire. It is interesting to learn that the additional contemplated capital expenditure over the next eight years was estimated at £465,000, with an increase of no more than 415 beds. The present maintenance cost of the Association is £360,000, equal to a rate of 8d. in the £. It was estimated that this would rise to £446,000, or a 10d. rate. Much pithy comment on the whole position is contained in the report of the Principal Medical Officer, who advocates regionalisation with larger administrative areas on county borough lines, financial aid from the central Government, an adequate whole-time staff and a uniformly efficient standard for the execution of all health duties.

Included in the Report are two short but interesting papers, one dealing with actinomycosis of the lung, the other with the results of laboratory examination of pleural effusions. The importance of taking ample quantities of fluid in which to search for tubercle bacilli is again shown, and not less than 500 c.c. is advocated. Using 30 to 50 c.c. in her own series of serous effusions, Dr. Ruth Milne found 67 per cent. positive results with inoculation experiments. Using less than 5 c.c., the figure was only 33 per cent.

Twentieth Annual Report of the Ministry of Health, 1938-39. London: His Majesty's Stationery Office. Price 5s. net.

The Twentieth Annual Report of the Ministry of Health for the year 1938-39 contains a number of encouraging statistics.

Both the infantile and the maternal mortality rates have been reduced to record low figures, and there were over 2,000 fewer deaths from tuberculosis, the biggest fall in one year since 1934. In this connection it is also encouraging to see that the Ministry's housing programme continued to expand and that there has been a further abatement in overcrowding.

The number of X-ray examinations performed at tuberculosis dispensaries, although on the increase, still remains small when compared

with the total number of attendances, and there is reason to believe that this may be due, in some cases, to lack of the necessary facilities.

The Report also contains much useful information relating to other diseases, and there is a section devoted to the Ministry's schemes for Civil Defence.

Primitive Tuberculosis. By S. Lyle Cummins. London: John Bale Medical Publications, 1939. Pp. 213. Price 10s. 6d.

This excellent monograph gives a complete survey of tuberculosis as it is found among primitive races. Including as it does a vast amount of detailed information, it is yet a work which will be remembered for the balance and judgment with which broad deductions and conclusions are again and again expressed. We doubt whether there is anyone else who could have attempted the task which the author set himself in writing this book, and certainly no one who would have carried it through to such a successful conclusion.

Dealing in the introductory chapters with tuberculosis among wild and domesticated animals, the important point is made that even where marked susceptibility is present infection cannot become established on an endemic scale without the appropriate environmental conditions. True as this is of the animal world in general it must also be true of man; and the author then describes those environmental and other factors which encircle the life of primitive tribes and bear upon the occurrence of tuberculosis among them. There follow ten detailed chapters on the disease among African natives, Africans who have temporarily left Africa, and Africans by descent and American Africans. Differences between the Borrel type of tuberculosis seen among the Senegalese troops meeting the disease for the first time and the acute type seen in South Africa are few, but occasional evidence of some fibrous reaction is found in the latter. The main difference seems to be that the South African natives show an acute onset, the Senegalese an insidious one, a difference explained by previous contact with the disease among the former and the development of hypersensitivity. The American negro still remains exposed to these acute forms of the disease, although for many generations now he has lived in close contact with white races.

Subsequent chapters then deal with the disease as it is found among primitive tribes in other parts of the world, animal tuberculosis as it may act as a source of human infection in the tropics, a brief review of prophylaxis by means of B.C.G. and of treatment among native populations. The book closes with a series of discussions centring around the vexed question of immunity to the disease. Though immunity undoubtedly occurs, and can be produced artificially in a limited way, it is constantly obscured in clinical work by its shadow, hypersensitivity, occurring as an outcome of the natural experiment in infection obtaining in every civilised person because of the ubiquity of the tubercle bacillus in such communities. The pith of the problem is aptly put in describing the relationship found between tuberculin sensitivity in South African "boys" and their subsequent tuberculosis morbidity. These showed that the group most sus-

ceptible was the group reacting most strongly to tuberculin a few months before. Though at first sight it might seem that this group, which had been in contact with the disease most clearly, should be the one to show evidence of the greatest degree of protection, the author points out that it is also arguable that this group had been most heavily infected, and should thus be the most liable to active disease, which in point of fact appeared to happen. However stormy and obscure may be the academic discussions of immunity phenomena in the disease, there is calmer water on the clinical side, for here the story is the same everywhere. The person who has no previous contact with tuberculosis is without power to resist it, though that power may be gained rapidly in civilised races because ancestors have been derived only from resistant strains, potent in their power to elaborate antibodies rapidly. The primitive man has no advantage such as this, and whereas it is easy, as a rule, for those of tried stock to develop immunity and overcome infection, it is hard for primitive man to do so. These few quotations serve to illustrate the clarity with which the author unfolds his conclusions, and it is pleasurable indeed to realise that the years of patient work which the author has devoted to this subject have been crowned by the achievement of this book.

Tuberculosis of the Upper Respiratory Tracts. By. F. C. ORMEROD, M.D., F.R.C.S. London: John Bale Medical Publications, 1939. Pp. 215. Price 21s.

This beautifully illustrated monograph is written largely from the writer's experience at the Brompton Hospital over a period of sixteen years. It is an ample testimony to the wealth of material which has been available and to the sound judgments which this has helped to form. Such an experience must be confined to few, and when combined, as it is here, with a wide but catholic outlook upon the literature, the result leaves no doubt that this monograph should stand as a classic. Apart from its excellent production and arrangement, it reads easily, and is replete with information on every aspect of the disease as this affects the upper respiratory tracts.

The greater portion of the book deals, as is proper, with laryngeal manifestations of the disease, and some sixty pages are devoted to treatment. The paramount importance of control of the underlying disease in the lung, and of vocal rest, is emphasised, the special indications for the use of galvanocautery described, and also for other surgical measures. In his section dealing with light therapy, the author concludes that it has no advantage over other measures, though local applications help with some cases, especially those with ulceration of the epiglottis. Prognosis still centres round the fact that laryngeal involvement doubles the fatality rate in phthisis.

The later sections of the book deal with the disease as it affects the pharynx and oral structures, the salivary glands, trachea and bronchi, œsophagus, nose and ear. A short account is included of uveo-parotid tuberculosis, including Brooks' recent observations on this condition. Tracheo-bronchial tuberculosis is reviewed at length, and the recent American literature given full credit for the interest which it has stimulated in this form of the disease and the types which have been defined.